

# INTERNATIONAL SEARCH REPORT

International Application No

GB2004/003032

A. CLASSIFICATION OF SUBJECT MATTER  
IPC 7 C01B17/04 B01D53/86

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 C01B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, PAJ, WPI Data

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4 798 716 A (PALM ET AL) 17 January 1989 (1989-01-17) cited in the application * claims; figure; column 5, lines 13-17; column 8, line 39- column 9, 43 *	1,4
X	EP 1 166 850 A (THE BOC GROUP PLC) 2 January 2002 (2002-01-02) claims; figure 3	1
A	EP 1 186 334 A (THE BOC GROUP PLC) 13 March 2002 (2002-03-13) paragraph '0045!; claims	1-12
A	EP 0 565 316 A (THE BOC GROUP PLC) 13 October 1993 (1993-10-13) cited in the application	

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

### \* Special categories of cited documents:

\*A\* document defining the general state of the art which is not considered to be of particular relevance

\*E\* earlier document but published on or after the international filing date

\*L\* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

\*O\* document referring to an oral disclosure, use, exhibition or other means

\*P\* document published prior to the international filing date but later than the priority date claimed

\*T\* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

\*X\* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

\*Y\* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

\*B\* document member of the same patent family

Date of the actual completion of the international search

21 April 2005

Date of mailing of the international search report

27/04/2005

Name and mailing address of the ISA

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Zalm, W

# INTERNATIONAL SEARCH REPORT

ial Application No  
32004/003032

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 4798716	A	17-01-1989	US 4849203 A	18-07-1989
EP 1166850	A	02-01-2002	EP 1166850 A1	02-01-2002
			US 2002021993 A1	21-02-2002
EP 1186334	A	13-03-2002	AU 777024 B2	30-09-2004
			AU 5801301 A	07-03-2002
			BR 0103441 A	02-04-2002
			CA 2354305 A1	28-02-2002
			CN 1340603 A	20-03-2002
			EP 1186334 A1	13-03-2002
			JP 2002145605 A	22-05-2002
			US 2002025292 A1	28-02-2002
			ZA 200106651 A	22-08-2002
EP 0565316	A	13-10-1993	AT 223252 T	15-09-2002
			AU 3546293 A	11-11-1993
			BR 9301445 A	13-10-1993
			CA 2093390 A1	07-10-1993
			CN 1086459 A	11-05-1994
			DE 69332260 D1	10-10-2002
			DE 69332260 T2	15-05-2003
			EP 0565316 A2	13-10-1993
			JP 3434313 B2	04-08-2003
			JP 6087605 A	29-03-1994
			NZ 247336 A	28-08-1995
			US 5468458 A	21-11-1995
			ZA 9302409 A	22-10-1993

# PATENT COOPERATION TREATY

## PCT

REC'D 19 SEP 2005

WIPO

PCT

### INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)


(PCT Article 36 and Rule 70)

Applicant's or agent's file reference M03B180/MW	<b>FOR FURTHER ACTION</b>		See Form PCT/PEA/416
International application No. PCT/GB2004/003032	International filing date (day/month/year) 13.07.2004	Priority date (day/month/year) 14.07.2003	
International Patent Classification (IPC) or national classification and IPC C01B17/04			
Applicant THE BOC GROUP PLC			

1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 5 sheets, including this cover sheet.
3. This report is also accompanied by ANNEXES, comprising:
  - a. ☐ sent to the applicant and to the International Bureau a total of sheets, as follows:
    - ☐ sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).
    - ☐ sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.
  - b. ☐ (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).

4. This report contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☒ Box No. VIII Certain observations on the international application

Date of submission of the demand  31.01.2005	Date of completion of this report  19.09.2005
Name and mailing address of the international preliminary examining authority:   European Patent Office - P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Tx: 31 651 epo nl Fax: +31 70 340 - 3016	Authorized Officer  Zalm, W  Telephone No. +31 70 340-



**INTERNATIONAL PRELIMINARY REPORT  
ON PATENTABILITY**

International application No.  
PCT/GB2004/003032

**Box No. I Basis of the report**

1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.
- ☐ This report is based on translations from the original language into the following language , which is the language of a translation furnished for the purposes of:
- ☐ international search (under Rules 12.3 and 23.1(b))
  - ☐ publication of the international application (under Rule 12.4)
  - ☐ international preliminary examination (under Rules 55.2 and/or 55.3)
2. With regard to the **elements\*** of the international application, this report is based on (*replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report*):

**Description, Pages**

1-22 as originally filed

**Claims, Numbers**

1-17 as originally filed

**Drawings, Sheets**

1/4-4/4 as originally filed

☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing

3. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages
- ☐ the claims, Nos.
- ☐ the drawings, sheets/figs
- ☐ the sequence listing (*specify*):
- ☐ any table(s) related to sequence listing (*specify*):

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

- ☐ the description, pages
- ☐ the claims, Nos.
- ☐ the drawings, sheets/figs
- ☐ the sequence listing (*specify*):
- ☐ any table(s) related to sequence listing (*specify*):

\* If item 4 applies, some or all of these sheets may be marked "superseded."

**INTERNATIONAL PRELIMINARY REPORT  
ON PATENTABILITY**

International application No.  
PCT/GB2004/003032

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**Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

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1. Statement

Novelty (N)	Yes: Claims	13-17
	No: Claims	1-12
Inventive step (IS)	Yes: Claims	13-17
	No: Claims	1-12
Industrial applicability (IA)	Yes: Claims	1-17
	No: Claims	

2. Citations and explanations (Rule 70.7):

**see separate sheet**

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**Box No. VIII Certain observations on the international application**

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The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

**see separate sheet**

**Re Item V**

**Reasoned statement with regard to novelty, inventive step or industrial applicability;  
citations and explanations supporting such statement**

1. Reference is made to the following documents:

D1 : US 4 798 716 A (PALM ET AL) 17 January 1989 cited in the application

D2 : EP 0 565 316 A (THE BOC GROUP PLC) 13 October 1993 cited in the application

2. Novelty

The present application does not meet the criteria of Article 33(1) PCT, because the subject-matter of **claims 1 and 4** is not new in the sense of Article 33(2) PCT.

Prior art document D1 (cited at page 1 of the description of the present application) discloses a Claus process wherein the tail gas is recycled to the burner furnace or to a Claus-catalyst stage. The recycle stream may contain either sulfur dioxide or hydrogen sulfide as single sulfur containing component. In case of hydrogen sulfide as component the recycle stream can be obtained making use of a reducing agent (line 49 of the figure). This is however not a compulsory feature of the process (see column 9, lines 38-40). The process of **claim 1,4** of the application under consideration wherein the recycle stream is passed to the upstream catalytic stage is known from D1 and considered not new.

Process **claim 1** of the present application includes the embodiment that the excess first portion can be passed to the Claus furnace remote from the combustion region (see step I): 'or' in line 24).

D2 teaches a process for the removal of sulfur from waste gas streams by the Claus process. After the burner (after sulfur removal) part of the gas stream is reduced with hydrogen in order to obtain a gas stream without sulfur dioxide. Water is subsequently removed and the stream is recycled to the burner. As goes from column 12, lines 29-33 the point of entry can be the furnace positioned directly after the burner in stead of the burner feed. This feature of claim 1 thus lacks novelty too.

3. Inventive step

The process according to **claim 1** whereby both measures are applied appears an obvious

combination of the teachings of D1 and D2 and thus is regarded not to meet the requirement for the presence of an inventive step (Art 33(3) PCT).

4. The process as defined by independent process **claim 13** whereby the recycle stream is introduced into the intermediate region of the first catalytic stage is not known from prior art nor derivable therefrom in an obvious way and appears to meet the requirement for patentability.

### Re Item VIII

#### **Certain observations on the international application**

The application does not meet the requirements of Article 6 PCT, because **claims 1 and 13** are not clear.

(i) The expression 'reduced' in step j) of claim 1 should be used in the meaning of 'sulfur dioxide content reduced', since it refers to a reduced content and not to a chemically reduced gas stream. In case the applicants are of the opinion that the method of reduction is always performed by reduction with the reducing gas hydrogen, this should be made clear by addition thereof to step i). In that case it appears that deleting the word 'content' from step i) than would overcome the objection. The description should be adapted thereto.

A similar objection (and solution therefore in order to overcome) is regarded to exist with regard to independent process claim 13.

(ii) **Claim 13** includes the option that the whole flow coming from the catalytic stage is recycled. It appears that at least some gas should be taken out of the stream at any point of the cycle in order to meet the requirement of mass balance in the system. Deletion of the words 'at least' (line 16) S would solve the problem.